SANTA CLARA COUNTY MEDICAL ASSOCIATION

Santa Clara County Medical Association

Wireless Silent Spring, SCCMA
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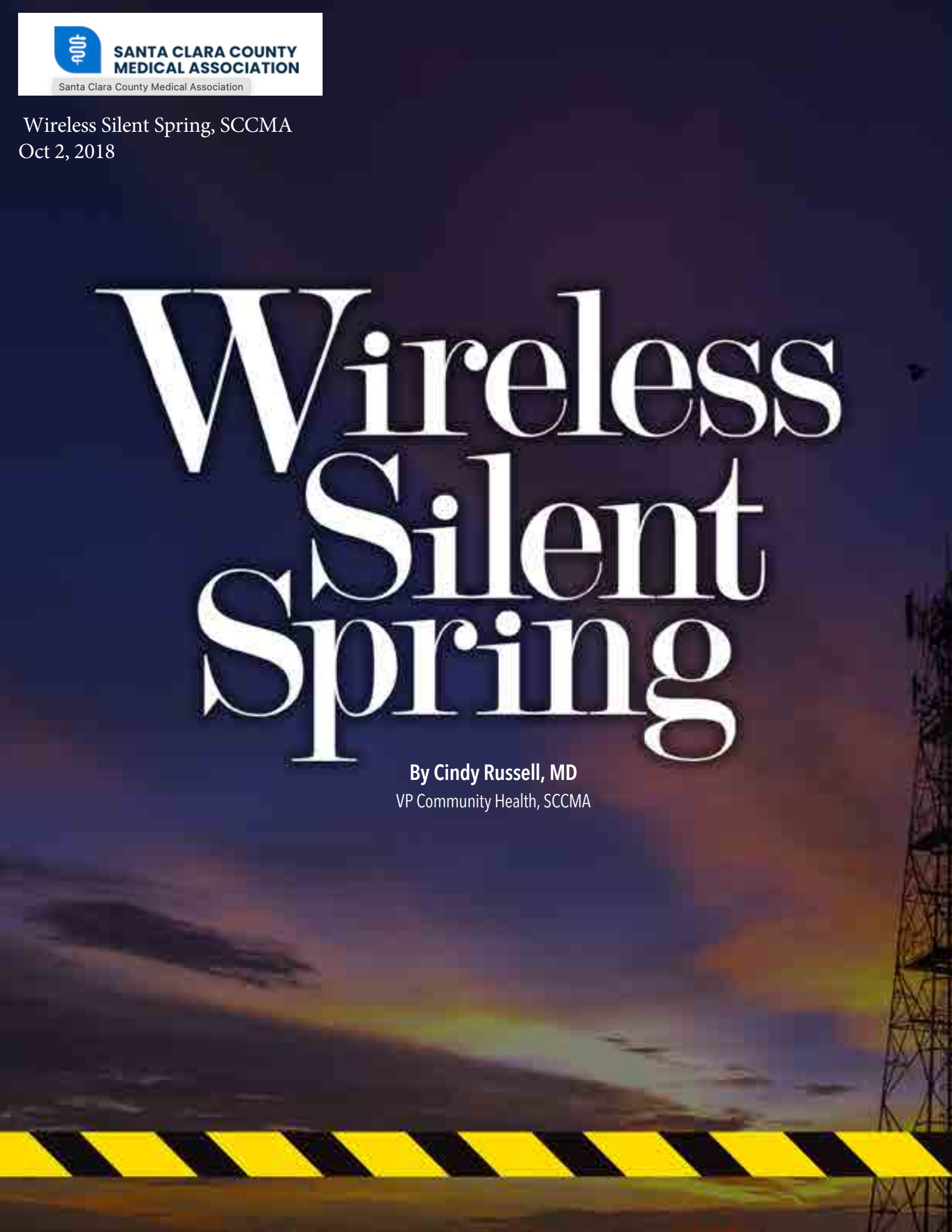
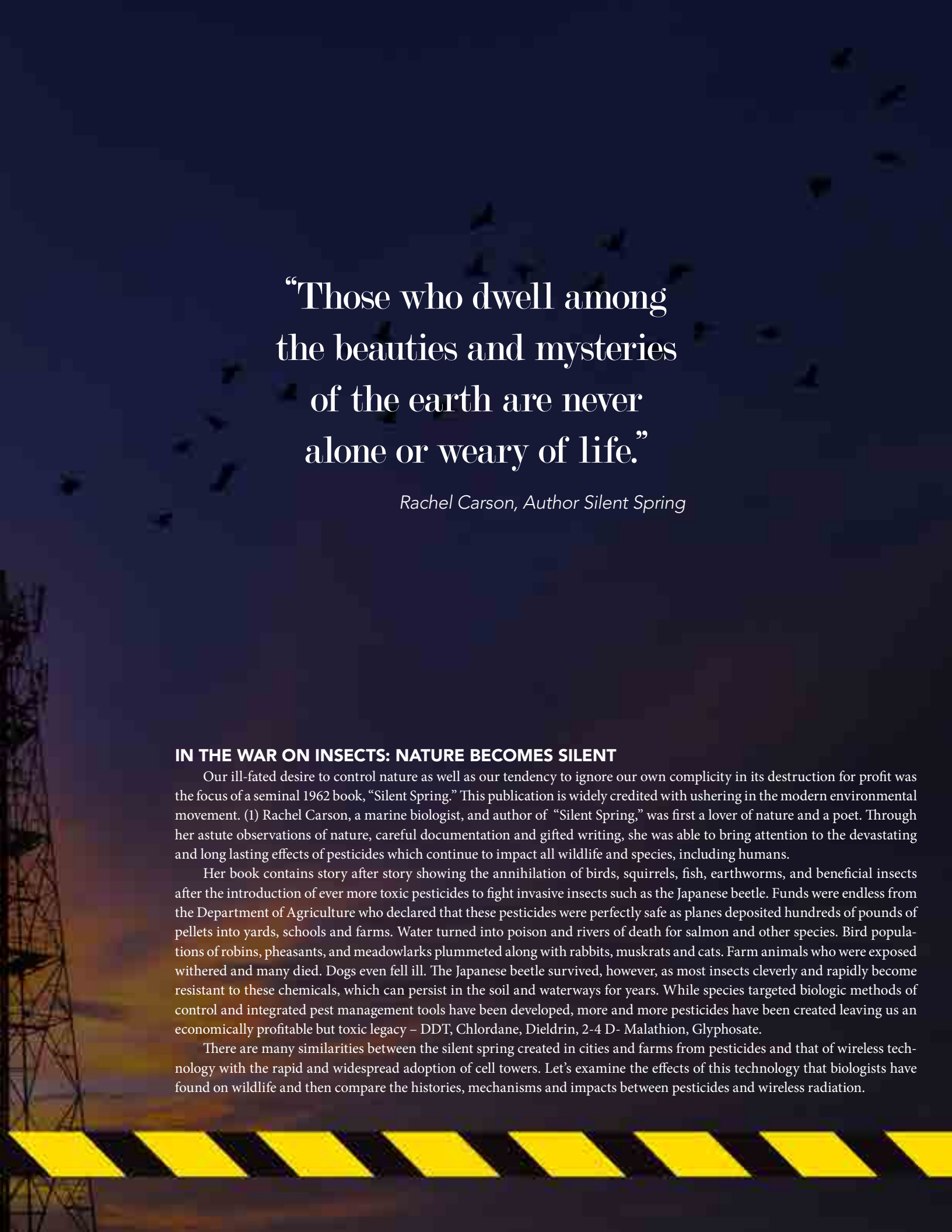
Wireless Silent Spring

By Cindy Russell, MD
VP Community Health, SCCMA





"Those who dwell among the beauties and mysteries of the earth are never alone or weary of life."

Rachel Carson, Author Silent Spring

IN THE WAR ON INSECTS: NATURE BECOMES SILENT

Our ill-fated desire to control nature as well as our tendency to ignore our own complicity in its destruction for profit was the focus of a seminal 1962 book, "Silent Spring." This publication is widely credited with ushering in the modern environmental movement. (1) Rachel Carson, a marine biologist, and author of "Silent Spring," was first a lover of nature and a poet. Through her astute observations of nature, careful documentation and gifted writing, she was able to bring attention to the devastating and long lasting effects of pesticides which continue to impact all wildlife and species, including humans.

Her book contains story after story showing the annihilation of birds, squirrels, fish, earthworms, and beneficial insects after the introduction of ever more toxic pesticides to fight invasive insects such as the Japanese beetle. Funds were endless from the Department of Agriculture who declared that these pesticides were perfectly safe as planes deposited hundreds of pounds of pellets into yards, schools and farms. Water turned into poison and rivers of death for salmon and other species. Bird populations of robins, pheasants, and meadowlarks plummeted along with rabbits, muskrats and cats. Farm animals who were exposed withered and many died. Dogs even fell ill. The Japanese beetle survived, however, as most insects cleverly and rapidly become resistant to these chemicals, which can persist in the soil and waterways for years. While species targeted biologic methods of control and integrated pest management tools have been developed, more and more pesticides have been created leaving us an economically profitable but toxic legacy – DDT, Chlordane, Dieldrin, 2-4 D- Malathion, Glyphosate.

There are many similarities between the silent spring created in cities and farms from pesticides and that of wireless technology with the rapid and widespread adoption of cell towers. Let's examine the effects of this technology that biologists have found on wildlife and then compare the histories, mechanisms and impacts between pesticides and wireless radiation.

"And it's not just pigeons — have you seen any sparrows or parrots around, since these towers started springing up?"

K. Pazhaniappan, Secretary,
New Madras Racing Pigeon Association (43)

WIRELESS RADIOFREQUENCY AFFECTS NAVIGATION OF BIRDS AND BEES

It is well known that magnetite, a form of iron ore, is found in a wide variety of organisms. It has been shown that this substance is used to sense the earth's low energy magnetic field as a directional reference. (Cadiou and McNaughton 2010). Magnetite acts as an internal compass. For over 50 years, scientists have known that migratory birds use the earth's magnetic field to navigate. As it turns out, a diverse array of animal life also relies upon this geomagnetic field as their GPS for breeding, feeding, migration and survival.

Biologists have unexpectedly discovered that wireless radiofrequency radiation (RFR) disturbs internal magneto-receptors used for orientation. In addition, this non ionizing radiation can have profound impacts on the natural environment by disruption of other complex cellular and biologic processes in mammals, birds, fish, amphibians, insects, trees, plants, seeds and bacteria. Reported adverse effects from radiofrequency radiation that have been identified include abnormal behavior, developmental abnormalities, diminished reproduction and increased mortality. The effects of this radiation may not be immediately apparent with a slow decline in the health of wildlife seen over time with cumulative exposure, adding a new environmental toxin contributing to silent springs in cities, orchards and farms. The more towers, the more additive mix of radiation frequencies saturating the environment, creating an increasingly toxic air space. Non thermal biological effects are not considered in current guidelines. Appropriate safety testing and regulation of this technology is lacking, however, invention, commercialization and deployment of cell towers marches on – 1G, 2G, 3G, 4G, 5G.

THE SKRUNDA RADIO LOCATION CASE

Firstenberg (2017) in his fascinating and well-referenced book, *The Invisible Rainbow: A History of Electricity and Life*, describes both observations and biological controlled experiments performed, mostly in Europe, where a high power early warning Radio Location Station tower was in place for over 25 years. (12) Studies performed during and after the tower was removed demonstrated that it caused not only human symptoms including documented memory, attention and motor deficits in children, but also affected widespread forest health with loss of birds, thinner growth rings on trees, poor seed germination, and loss of duckweed, among other effects. (3) When these towers were removed, not only did the health of the local residents improve, the forest recovered.

BIRD MIGRATION DISRUPTED MORE BY WEAK MAGNETIC FIELDS

Biologists have discovered that birds' magnetic compass orientation appears more vulnerable to weak broadband electromagnetic fields. Pakhomov (2017), Schwarze (2016), Wiltschko (2015). A German scientist, Svenja Engles (2014) lead the research project to confirm this effect. He and his German graduate students exposed migratory European robins to the background electromagnetic noise present in unscreened wooden huts at the University of Oldenburg city campus and found the birds were confused and could not orient using their magnetic compass. If grounded or screened with aluminum their orientation reappeared, but disappeared again if broadband radiofrequencies were generated inside the huts. He did not believe the effects at first and repeated the same double-blinded experiment many times in seven years and with different graduate students to confirm the effect before publishing his results.

WHEN HOMING PIGEONS CAN'T FIND HOME

Modern communications systems with a proliferation of cell towers in cities and now in rural areas, create continuous pulsating artificial radiofrequency wave mixtures that can alter local magnetic fields and thus impair bird migration and orientation of pollinators. In a straight line, sight cell towers can transmit 20 miles or more. In 1998, soon after cell towers were installed in Pennsylvania, pigeon races ended in disaster as up to 90% of birds were disoriented and lost their navigational skills. This was reported in a *New York Times* article December 6, 1998, "When Homing Pigeons Don't Go Home Again." (2)

The problem of lost homing pigeons is becoming commonplace, leaving pigeon racing aficionados very concerned. (6)(13) A 2013 *British Pigeon Insider* article notes that pigeon keepers in England reported the loss of dozens of pigeons during races, as well as abnormal frantic behavior near cell towers and declining pigeon reproduction as cell towers have been reproducing in cities and farms. Another article in *Wired* magazine cites one pigeon fancier who lost two-thirds of his pigeons after a tower was installed next to his farm.

FATAL ATTRACTION: COLLISIONS WITH CELL TOWERS

The Audubon Society reports that each year up to 50 million birds, representing 230 different species, die in collisions with communication towers at night. (8) This occurs when they hit the tall, antenna-sporting structures or associated guy-wires that support the cables. It has been found that at night birds are lured into the deadly metal structures by the steady beam of red lights on the tops of the towers. The lights are required by law for airline safety but the birds see this as a guiding light and shift from using geomagnetic signals and instead head straight for the beam.

An FAA study showed that small migratory birds become confused when they reach the light and either hit the tower or they continue to fly

around the tower until exhausted and they fall to the ground. Flashing red lights seem to reduce the number of fatal bird collisions. (11) Longcore (2013) studied the numbers and types of birds killed by cell towers in the U.S. and Canada and found "Neotropical migrants suffer the greatest mortality; 97.4% of birds killed are passerines, mostly warblers (Parulidae, 58.4%), vireos (Vireonidae, 13.4%), thrushes (Turdidae, 7.7%), and sparrows (Emberizidae, 5.8%). Thirteen birds of conservation concern in the United States or Canada suffer annual mortality of 1–9% of their estimated total population." A 2015 FAA guideline strongly encouraged operators of all tall cell towers to switch to flashing red lights by 2016. In November of 2016 about 750 tall towers (above 350 feet) had been switched, leaving about 15,000 more to go, according to an American Bird Conservancy report. (24)

CELL TOWERS NOT HEALTHY FOR BIRDS OR FIREMEN

Government agencies, however, are becoming more aware. The Department of Interior wrote a letter in 2014 to the National Telecommunications and Information Administration regarding the DOI concerns about the First Responder Network Authority (FirstNet) and their regulations regarding cell towers and the protection of wildlife, especially migratory birds.(15) FirstNet is a public-private partnership with AT&T and because of its stated duty to public safety it has significant preemptions. (17) The DOI stated, "the proposals lack provisions necessary to conserve migratory bird resources, including eagles. The proposals also do not reflect current information regarding the effects of communication towers to birds." FirstNet noted that the DOI "requested that FirstNet's procedures include a process for ensuring compliance with the Bald and Golden Eagle Protection Act ('BGEPA'), Migratory Bird Treaty Act ('MBTA'), and Executive Order (E.O.) 13186, Responsibilities of Federal Agencies to Protect Migratory Birds." (16)

The DOI is not the only one concerned about FirstNet towers. Although public safety is important, what happens when the device intended for safety causes an unintended threat to others? Some firemen have experienced a variety of neurologic symptoms consistent with electrosensitivity (headaches, dizziness, brain fog, sleep deprivation, irritability) when cell towers were placed on their fire stations. A pilot study of firemen was completed in 2004 and brain scans confirmed those with symptoms had evidence of adverse brain alterations. Because of this, the International Association of Firefighters has developed a policy to ask for exemptions from cell tower placement on or adjacent to fire stations with new cell tower legislation. (19) It is codified in California's AB57 (2015). (18)

THE DECLINE OF BIRDS, BEES AND WILDLIFE WITH INCREASING RADIOFREQUENCY RADIATION

Researchers are now attributing wireless radiation from cellular communications to be a significant contributing cause of bee "colony collapse disorder," insect disappearance, the decline in house sparrows in London (Balmori 2007) (Everaert 2007), as well as the steady deterioration of the worlds bird population with now more than 40% of bird species under critical threat. Insects are not only important pollinators, they are the base of the food chain for birds, amphibians, reptiles and mammals. A Yale report highlights a 2014 study by Stanford professor Rudolfo Drizo, which revealed that 42% of the 3,623 terrestrial invertebrate species on the International Union for Conservation of Nature [IUCN] Red List, are classified as threatened with extinction. He notes, "human impacts on animal biodiversity are an under-recognized form of global environmental change." (5)

WIRELESS RADIATION AND COLONY COLLAPSE DISORDER

Bees are a critical pollinator species for agricultural productivity. (20) Of the 100 crops that provide 90% of the world's food supply, 71 are pollinated by bees, according to the U.N. Environmental Program, #Friday Fact. (21) The report also notes that to produce 1 kilogram of honey, a bee must visit four million flowers and fly a distance equivalent to going around the Earth four times. Bee numbers have plummeted in Europe, the United States and around the world in the last two decades. Contributing factors affecting the health and reproduction of bees include pesticides, global climate change, loss of habitat and air pollution with new research pointing towards microwave radiation as an important and yet unrecognized cause for concern. Bees, as well as birds, contain magnetite magneto-receptors in their abdomen.

Electromagnetic microwave radiation has been shown to disrupt bee behavior and may cause worker bees to emit a piping signal to swarm. The bees have also demonstrated aggression after 30 minutes of cell phone exposure. Favre (2017)

A cell phone placed next to a bee hive appears to cause a slow destruction of the hive. (Dallo 2015) concludes in his research, "significant decrease in colony strength, honey stores, pollen reserves, number of foragers returning to their hives and egg laying capacity of queens in test colonies. Cell phone radiations disturbed navigational skills of foragers."

Lazaro (2016) looked at the effect of mobile communication antennas

on the abundance and composition of wild pollinators, including wild bees, hoverflies, bee flies, remaining flies, beetles, butterflies, and wasps on two Greek islands with variable distances from cell towers, carefully measuring the radiofrequency radiation. He found negative effects in all groups except butterflies.

Belgian entomologist Marie-Claire Cammaerts (2017) has done a number of studies on RFR and found that insects are particularly sensitive. She writes, "Before the invention of the wireless technology, plenty of active insects fed on crops, flowers, fruits, where they ate, drank, collected nectar, and numerous dead insects were found crushed on cars. Nowadays, all this no longer occurs at such an extent [2]. Bees may be particularly affected by manmade electromagnetism [21,22,23] – When crossing such electromagnetic fields, bees may no longer remember their way, may no longer fly in the correct direction, and may become unable to go back to their hive."

These are truly alarming findings and serve as a dire warning on further wireless expansion, especially with regards to sensitive wildlife areas and agricultural rural zones that depend on pollination.

5G ESPECIALLY HARMFUL TO INSECTS: THE RESONANCE EFFECT AND PHASED ARRAYS

Proposed 5G millimeter wavelengths are a similar size to insects and this creates a damaging vibrational effect known as resonance on the organism. Resonance is a well-known phenomenon in physics. A common example is that of a wine glass which shatters when an opera star reaches a high C note, vibrating air molecules matching the glasses natural oscillating frequency. In general, mechanical resonance occurs when the frequency of an oscillation matches the system's or its subcomponent's natural frequency and this results in increasingly intensified additive vibration with more energy being absorbed, causing more disturbance of the system. At low power an effect is greatly magnified. Thielens (2018) looked at this effect on four different insects exposed to electromagnetic fields from 2 to 120 GHz. He noted, "The insects show a maximum in absorbed radio frequency power at wavelengths that are comparable to their body size – This could lead to changes in insect behavior, physiology, and morphology over time due to an increase in body temperatures, from dielectric heating."

In addition, a newer technology previously used in the military for early warning missile radar systems, PAVE PAWS, is incorporated into these 5G systems and called phased arrays. (29) These powerful "beam steering" arrays scan back and forth from tower to device for easier connection with an individual's movement, to detect the device, similar to the surface-to-air missile systems. (30) They are also used in AM and FM Broadcast stations and planned for automotive sensors and satellites. What effect will this increase in power and density of environmental radiation have on our beneficial insects and pollinators?

REVIEW STUDIES POINT TO WILDLIFE HARM

Balmori (2015) states in his latest review "Current evidence indicates that exposure at levels that are found in the environment (in urban areas and near base stations) may particularly alter the receptor organs to orient in the magnetic field of the earth. These results could have important implications for migratory birds and insects, especially in urban areas, but could also apply to birds and insects in natural and protected areas where there are powerful base station emitters of radiofrequencies.

Cucurachi (2012) in reviewing 113 peer-reviewed publications revealed, "In about two thirds of the reviewed studies ecological effects of RF-EMF was reported at high as well as at low dosages. The very low dosages are compatible with real field situations, and could be found under environmental conditions."

The Ministry of Environment and Forest in India (MOE 2010) examined all available peer reviewed research on the impacts of wireless radiofrequency (RF) on living organisms at the time, including birds and bees. They found that 593 of the 919 articles showed adverse impacts. In each category of organism, over 60% of the research indicated harm to that biological species.

TREES DAMAGED BY CELL TOWERS

Aspen trees reproduce primarily from sprouting from the roots. If a stem dies, another fresh shoot is sent up. "Clones" of tree stands are thus created that can live hundreds to thousands of years. The health of Aspen tree stands is determined by mature trees with shoots and saplings in between. In Colorado, Aspen trees have been on the decline for decades but rapid mortality has been observed in clones since 2004. (25) A preliminary experiment on trembling Aspen trees points to ambient elec-

"The exponential increase of mobile telephony has led to a pronounced increase in electromagnetic fields in the environment that may affect pollinator communities and threaten pollination as a key ecosystem service."

Lazaro 2016

> "When crossing such electromagnetic fields, bees may no longer remember their way, may no longer fly in the correct direction, and may become unable to go back to their hive."
>
> *Marie-Claire Cammaerts (2017)*

tromagnetic radiation from a variety of sources (cell towers, satellites, RF from electric power generation) causing poor growth and smaller leaves. Seedlings shielded from surrounding low level background RF radiation produced vigorous shoot growth, no necrotic lesions and rich pigmentation in the leaves due to anthocyanin production, versus unshielded seedlings which had a high percentage of leaf necrotic tissue and a reduction in shoot length. (Haggerty 2009)

Waldmann-Selsam et al (2016) clearly demonstrated, in a robust four year study with accurate RF emission testing, cell tower radiation causing the death of nearby trees over time. He notes, "These results are consistent with the fact that damage afflicted on trees by mobile phone towers usually start on one side, extending to the whole tree over time."

ARE BEE DRONES THE ANSWER? "SMART" OR DUMB POLLINATION?

Wireless technology, however convenient, has consequences. High tech has invaded every corner of our lives and will soon be used in agriculture to pollinate crops as bee colony collapses disorder worsens. In a CNN article "This 'bee' drone is a robotic flower pollinator" the developer notes "It could conceivably be used in large-scale farming, even in hydroponic farming." (22)

As cell towers and wireless systems proliferate, will we continue to ignore their role in harming life sustaining ecosystems? Will we create dead zones in cities where urban or rural farmers will not be able to grow food or have a vegetable garden? Agriculture is already under siege from many other environmental threats. Without bees there will be no pollination or honey. Without birds there will be no seed dispersal.

The tech industry may advise us to use the very technology that is harming ecosystems by using bee drones to pollinate our crops. Walmart has already filed a patent for a robotic bee. (23) These high tech insects would be directed by 4G or 5G radiation to operate via the Internet of Things. Because the size of 5G frequencies matches that of insects, this radiation acts as an insecticide (Yadav 2014). What about ownership of drones, privacy, security and adverse effects on sensitive native bees and flowers, e-waste and energy consumption with the use of these drones? Many questions with no answers but predictable negative consequences. We have been there before with pesticides, asbestos, lead, mercury, with new emerging toxins being regularly introduced. The fallout on public and environmental health continues.

SCIENTISTS APPEAL TO THE UN FOR PROTECTIVE HEALTH AND ENVIRONMENTAL STANDARDS

Scientists who study radiofrequency radiation note a serious lack of monitoring and protocols to study the impacts of wireless technology and biologists are calling for precaution in the placement of cell towers with further expansion of wireless broadband. As of August 30, 2018, 244 EMF scientists from 41 nations have signed an Appeal calling upon the United Nations, the WHO and the UNEP to address the public health and environmental concerns raised in an extensive and growing body of scientific evidence on the broad adverse impacts of wireless radiation. (33)

GETTING SMARTER: PREVENTION VERSUS TREATMENT

Solving the real problems causing the decline in wildlife seems smarter than always trying to develop a new and potentially more toxic industry to fix it. Indeed, pesticides, habitat loss, over fishing, overhunting, overpopulation, global climate change, environmental toxins, plastics in the ocean have had a devastating impact on species. The World Wildlife Fund and the Zoological Society of London reports that over half of the earth's wildlife has been lost in the last 40 years. (27)

Prevention is far easier and more economical than treating a problem, especially if the problem becomes irreversible (global climate change). Physicians prescribe medications to treat chronic diseases of our modern cul-

"Everything is reversible because everything is unfortunately of humankind's making."

Tris Allinson, Bird Life's senior global scientist, on the decline of birds

ture. They are now recognizing, however, that many of these synthetic medications, while useful, can cause side effects that may be worse than the disease being treated. Current medical care is focused more on cure or treatment than prevention or precaution, causing continuing escalation of health care costs. Would it be better, instead, to encourage lifestyle changes to promote health and wellness with a holistically healthy diet, exercise and policies to reduce environmental toxic exposures?

WHAT IS A SAFE LEVEL OF RADIOFREQUENCY? STANDARDS ONLY LOOK AT HEAT

Current guidelines for radiofrequency exposure are set at levels that cause tissue heating, the assumed cause of harm from this radiation. The balance of scientific evidence now indicates that there are significant adverse effects of this wireless radiation at non-thermal levels. (Belpomme 2018) Environmental effects on wildlife and plants confirms this. The mechanism has been found to be related to calcium channel membrane effects and oxidation.

BIOINITIATIVE REPORT

Sage, Carpenter, Blank and other scientists note in the BioInitiative Report that non-thermal bio-effects are clearly established. The Bioinitiative Report reviewed studies looking at the lowest levels of non-thermal, non-ionizing radiofrequency that did not cause harmful biological effects. Their conclusions, based on peer reviewed research, indicated that there should be a "scientific benchmark of 0.003 uW/cm2 or three nanowatts per centimeter squared for 'lowest observed effect level' for RFR is based on mobile phone base station-level studies." They also suggest "Applying a ten-fold reduction to compensate for the lack of long-term exposure – or for children as a sensitive subpopulation." This would be a recommended precautionary action exposure level of 0.0003 uW/cm2. (Bioinitiative 2012) Our current U.S. guideline is 200 uW/cm2 to 1000 uW/cm2 for RF radiation depending on frequency. This is a substantial difference and indicates a need for re-evaluation of FCC safety standards and consideration of published scientific research indicating non-thermal effects. (NTP 2018)

INDEPENDENT SCIENCE IGNORED

Professor Emeritus of Biochemistry at Washington State University, Dr. Martin Pall, has written extensively on this subject. In a recent paper "5G: Great Risk for EU, US and International Health," he looked at eight distinct types of harm from electromagnetic field exposure. This included DNA damage, carcinogenicity, endocrine, nervous system and reproductive effects. Of 22 robust independent research review papers on non-thermal EMF effects published on or before 2013, 20 were ignored by the latest report of the European Commission's Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR).

There is an urgent need for government agencies to adopt a realistic biologically based radiofrequency exposure standard to replace the 20-year-old thermal (SAR) standard, which is far too permissive and not protective of human or environmental health.

WIRELESS SILENT SPRING: PARALLELS BETWEEN PESTICIDES AND WIRELESS RADIATION

In rereading Rachel Carson's book, *Silent Spring*, I was struck by the many similarities between pesticides and wireless radiation.

BOTH ARE INVISIBLE

Pesticides act as an invisible poison that works on a cellular level and can abruptly or slowly cause disease. You cannot see or taste it on your food or smell it as it drifts through the neighborhoods and enters creeks.

Wireless radiation is similarly silent to most. You typically cannot hear, feel or see radiofrequency radiation unless you are electrosensitive. Cellular and biologic damage however is occurring.

BOTH ARE UNIVERSAL IN OUR ENVIRONMENT

Pesticides are routinely sprayed in homes, gardens, on trees, in forests to strike insects far and wide. Biomonitoring studies nationwide and in California show pesticides still present in blood, urine and breast milk. (California Biomonitoring) (CDC Biomonitoring NHANES)

Wireless radiation is found almost ubiquitously in homes, businesses and schools to connect us to the world and with each other instantaneously. This is supported by well over 300,000 cell towers in the U.S. not counting private cell towers. The continuous pulsating waves of radiation stray into any nearby living organism, be it human, pet or wildlife.

LIFE LONG EXPOSURES: CRADLE TO GRAVE

Pesticides and their sometimes more toxic residues are now found in all human cord blood, urine and breast milk, and in children who do not eat organic foods. (Bradman 2003) (Curl 2003) (Lu 2006) (Salama 2017) (CDC Biomonitoring)

Exposure to wireless radiation now begins in the fetus with cell towers along with a host of wireless devices in the homes (i.e. cell phones, Tablets, Wi-Fi routers, smart meters, and now baby toys, smart cribs and wearable technology).

NON SELECTIVE TARGETS TO LIVING ORGANISMS WITH INDISCRIMINANT HARM

Pesticides are sprayed in large areas to kill a few flying insects but end up harming all species and the balance of nature with ecosystem effects. (EPA Persistent Organic Pollutants)

Wireless radiation is sprayed in all directions to find the intended device but also penetrates all living organisms causing cellular damage with ecosystem effects. (Balmori 2010), (Cucurachi 2012) (Sivani S and

Saravanamuttu 2013) (NTP 2018)

BOTH CAUSE A VARIETY OF ADVERSE BIOLOGICAL EFFECTS

Pesticides can have many toxic biologic impacts and are associated with malignant, neurodegenerative, respiratory, reproductive, developmental, and metabolic diseases in humans. DDT and its metabolite DDE was found to cause blindness in fish and can act as an endocrine disruptor, mutagen and carcinogen. Women exposed to DDT before puberty are five times more likely to develop breast cancer. Glyphosate is linked to cancer. (Creesey 2015) (Soto 2015) (Mostafalou S and Abdollahi M 2013, 2017)

Wireless 2G radiation was found to cause DNA damage and increase the risk of cancer of the heart and brain in a recent 10 year, $25 million dollar National Toxicology Program study (NTP 2018). Non-ionizing radiation from 3G and 4G cell towers have been found to cause nonspecific symptoms of electrosensitivity in some living within 300 meters of a cell tower including insomnia, dizziness, brain fog, fatigue, depression and heart palpitations. Cell phone radiation has been associated with harm to the reproductive system, neurologic system, immune system and hematologic system. (Bioinitiative Report 2014) (Oceana Report)

BOTH ARE CHILDREN OF WAR

Pesticides were first developed as agents of chemical warfare. They happened to kill the research insects and thus became commercialized for that purpose after the war. We can now buy pesticides in the grocery store.

Radiofrequency microwave technology was developed in World War II. Known as radar, it has many military uses including for surveillance, missile control, air traffic control, moving target indication, weapons location and vehicle search. (39) At the end of the war, microwave ovens were developed after an engineer discovered a candy bar in his pocket had melted when he was near the magnetron power source. (38) Millimeter technology (95GHz) has been developed for crowd control (Active Denial System). (40) The recent health problems of Cuban, Canadian and Chinese diplomats and their families has been attributed to microwave radiofrequency radiation effects from either RF surveillance or deliberate attacks. (36). Our homes typically have many wireless devices such as cell phones, cordless phones, Wi-Fi, smart meters as well as microwave ovens.

BOTH ARE BIOACTIVE: TOXICITY THROUGH OXIDATION

Pesticide toxicity can take various forms with a direct neurotoxic effect, DNA damage, immune suppression and endocrine disruption through disturbance of many cellular processes. (Mostafalou S and Abdollahi M. 2013, 2017) Newer research on the mechanisms of toxicity of pesticides is focusing on oxidative damage (free radical formation) as the result of a multistep process causing cellular disruption, tissue damage, chronic disease and cell death. (Agrawal 2010) Antioxidants have been shown to lessen the toxic effects of pesticides as well as chemicals. (Akefe 2017)

Wireless radiofrequency radiation has also been shown to have a primary mechanism of harm from oxidation. Yamenko (2016) looked at 100 studies of RF radiation both in vivo and in vitro and found 93 showed oxidation as a mechanism of toxicity. Research on antioxidants including curcumin, vitamin C, vitamin E, melatonin show protection against the effects of non-ionizing radiation with a reduction in oxidative stress.

ADDITIVE TOXIC MIXTURES MORE HARMFUL

Pesticide exposure does not happen in isolation. Typically, we are exposed to a mix of pesticides in the food we eat. These pesticides circulate in our system for a variable length of time from hours to years and can be stored in our fat or breast milk. The toxic interactions can be long term. A conventional potato has 41 pesticides, 14 of which are classified as carcinogens. (44) EWG tested strawberries and found about 22 pesticides in a conventionally grown berry. Research has shown that mixes of chemicals and pesticides have additive and synergistic toxic effects. For approval, however, these pesticides are studied only one at a time and without their "inactive" ingredients.

The more pesticides we are exposed to the greater the mix of adverse effects on the immune system, reproduction, carcinogenicity, as our protective enzyme and antioxidant mechanisms are overwhelmed. One pesticide can act as a mutagen, the next an endocrine disruptor and the next suppress your immune system to promote cancer. A true toxic triad of effects.

Wireless technology has continued to evolve and expand. The 1G analogue system worked well but did not carry much data. While new generations have been introduced to the marketplace to serve our unquenchable appetite for instant wireless information and communication, the old will still be in place – 2G, 3G, 4G. With the latest proposed 5G technology and the Internet of Things, industry aims to integrate this with other wireless generations, and even open up any remaining radiofrequency spectrum, creating a blanket of mixed frequency wireless radiation wildlife and humans will be exposed.

Radiation emissions are not only from cell towers, but also in remotely-controlled stratospheric balloons (Loon Project) and proposed low orbiting satellites, greatly increasing ambient levels of electromagnetic radiation (EMR). Like pesticides there has been inadequate research into the mix of frequencies we are exposed to. The 2018 NTP study, which found clear evidence of carcinogenicity, looked only at 2G technology. There are no government plans for testing of 3G, 4G or 5G individually or in combination. Synergistic effects of wireless radiation and toxic chemicals has

> "Doubt is our product since it is the best means of competing with the "body of fact" that exists in the minds of the general public. It is also the means of establishing a controversy." (22)
>
> *Tobacco executive, from Doubt is Their Product, David Michaels*

also not been attempted. Despite a virtual research vacuum on 5G high frequency radiation, federal and state legislation is being introduced and quickly approved to ensure the rapid deployment of this technology by removing local jurisdiction and limiting fees for cities and counties to use the public right of way. (32)

SENSITIVE HUMAN POPULATIONS IN BOTH

Pesticides appear more toxic to some people who do not have the metabolic pathways to transform and excrete them. For organochlorine pesticides such as DDT and Lindane it has been shown that there are genetic variations in the cytochrome P450 system to break down these pesticides, causing increased risk of disease. (Docea 2017) Those pesticide workers with paranoxonase genetic polymorphism suffer chronic toxicity exhibited by nausea, dizziness, headaches, fatigue and gait disturbance. Symptoms in those individuals with multiple chemical sensitivity are similar. (Lee 2003) (Rossi 2018)

Wireless radiofrequency radiation is observed to cause non-specific symptoms of headaches, dizziness, insomnia, nausea, irritability, depression and heart palpitations in those who are electrosensitive. This was first reported by NASA in military personnel working on radar and was called "microwave illness." (NASA 1981) Although some claim this could be a psychologic condition, researchers have identified a high correlation of symptoms to inflammatory and other biomarkers which can aid the diagnosis. Belpomme (2015) conducted a large clinical study and found laboratory biomarkers that connect multiple chemical sensitivity to electrosensitivity. It also has been noted that having these conditions causes predictable isolation and fear which can lead to neuropsychiatric symptoms. (41)

INDUSTRY DECEPTION

Pesticides have been well protected by the industry that created them. An investigation of over 20,000 documents including internal scientific studies, meeting minutes and memos from federal regulatory agencies and manufacturers was led by the Center for Media and Democracy and the Bioscience Research Project resulting in "The Poison Papers" of 2018. (46) Concealment, political manipulation, cover-up and collusion were found, along with suppression of fraudulent independent research and secrecy of the toxic effects of chemicals and pesticides.

Wireless telecommunications have been regulated by the Federal Communications Commission (FCC) since the 1996 Telecommunications Act was passed. The Environmental Protection Agency was relieved of their oversight duty of radiofrequency radiation prior to that. This 1996 Act assumed, even before testing, that there were no health or environmental effects of this radiation. It is specified in the law that health and environmental effects cannot be used as an argument to deny cell tower placement. This has hampered attempts to monitor or identify health effects in the United States. Harvard's Center for Ethics investigation of the wireless industry, written by Norm Alster, resulted in a publication called "Captured Agency: How the Federal Communications Industry is Dominated by the Industries it Presumably Regulates." (47) Highlighted is industries exorbitant lobbying influence to the tune of about $400 million a year according to the Center for Responsive Politics. A revolving door in Washington was also noted with telecom industry executives filling the critical "independent" government positions.

In her book, "Disconnect," Dr. Devra Davis documents industry manipulation along with discrediting of scientists who have identified and published literature on the adverse health effects of wireless radiation. (48)

OUR FATE IS THAT OF NATURE

We are just beginning to understand the fragile biologic complexities of the earths living creatures as we simultaneously document natures decline under the dismissing hand of mankind. Many have warned that our fate will follow that of nature. The expansion of wireless technologies for human convenience will require more cell towers on every street corner. This will threaten natural ecosystems in favor of immersive and invasive technology which is contributing to both negative environmental, physical and mental health effects, especially on our youth.

SAFER SECURE ALTERNATIVES: FIBEROPTIC, CABLE AND LANDLINES

The internet has become a necessity to most people. It can be provided in a safer manner to reduce EMR exposure. Alternatives such as fiberoptic networks and cable exist that are faster, more fire resistant, use less energy and are cheaper in the long run. (49) Traditional copper landlines are reliable in emergencies, are cheap, already built, and connect everyone without risk. Why remove them? We can have the benefits of faster, dependable and more private communications without compromising public or environmental health.

Recommendations by Biologists and Scientists in a 2010 Report by the Ministry of Environment and Forests in India to Protect Wildlife from EMR (paraphrased) (MOE 2010)

1. Electromagnetic radiation (EMR) should be recognized as a pollutant.
2. Create laws to protect urban flora and fauna from EMR.
3. Create protected areas with no cell towers.
4. Require bold signs on the dangers of radiation to be displayed on all cell tower structures.
5. Perform regular independent auditing of EMR/RF in urban localities – schools, hospitals, residential, recreational and ecologically sensitive areas.
6. Require blinking red lights on cell towers to protect birds at night.
7. Create laws to enable removal of existing problematic mobile towers to protect human or environmental health.
8. Require ecological assessment and review of sites identified for installing towers before their installation in wildlife, ecologically sensitive or conservational important areas.
9. Strictly control installation of mobile towers near wildlife protected areas, breeding areas, bee colonies, zoos, and identify with scientific studies appropriate distances from tower structures as part of pre-installation review.
10. The locations of cell phone towers and other EMF radiating towers along with their frequencies should be made available on public domain. This information would help in monitoring the population of birds and bees in and around the mobile towers and also in and/or around wildlife protected areas.
11. Public consultation to be made mandatory before installation of cell phone towers in any area. The Forest Department should be consulted before installation of cell phone towers. The distance at which these towers should be installed should be studied on a case by case basis.
12. The government should educate the public about the dangers of EMR and need for precaution, placing signs in wildlife areas and zoos.
13. To prevent overlapping high radiation fields, new towers should not be permitted within a radius of one kilometer of existing towers.
14. If new towers must be built, construct them to be above 80 feet and below 199 feet tall to avoid the requirement for aviation safety lighting. Construct un-guyed towers with platforms that will accommodate possible future co-locations and build them at existing 'antenna farms,' away from areas of high migratory bird traffic, wetlands and other known bird areas.

ABUNDANCE OF LIFE AND DIVERSITY OR A WIRELESS SILENT SPRING?

Natures communication systems evolved using minute electromagnetic signals in tune with the earth and each other. They are being overwhelmed now with manmade artificial electromagnetic radiation, that in combination with other well established environmental threats spells disaster. Rachel Carson called for humans to "act responsibly, carefully, and as stewards of the living earth." Science and observation is warning us that a thoughtful approach to all of man-kinds activities is imperative, to favor the protection of biodiversity over profit, innovation or convenience. We need to take a lesson from nature that acts slowly and deliberately to create a healthy balance. Rapid shifts in technology are changing our social structure and separating us from reality, each other and the natural world. There are no limits to "disruptive" 21st century wireless technology nor any meaningful safeguards. If we don't slow down and think about the risks as well as the benefits of high tech, will it quietly lead us to a wireless silent spring and then to a silent Earth?

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